






Ts. DR. KHADIJAH HILMUN KAMARUDIN

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QUALIFICATIONS

- Doctor of Philosophy (Physics), Universiti Malaysia Terengganu
- Master of Science (Medical Physics), Universiti Sains Malaysia
- Bachelor of Science (Physics), Universiti Kebangsaan Malaysia

FIELD OF RESEARCH

- Polymeric Materials
- Solid Bio-Polymer Electrolytes
- Solid State Ionics
- Battery
- Supercapacitor

RESEARCH INTEREST

My interest is in polymeric materials and solid state ionics. I am particularly interested in the preparation and characterization of polymeric materials, with applications in solid-state electrochemical devices such as proton battery and supercapacitor. My current research is focused on the preparation and characterization of solid electrolytes based biodegradable polymer for all-solid-state electrochemical device applications.

RESEARCH PROJECTS

- Electrochemical performance of supercapacitor and battery: effect of electrode thickness, milling time, types of binder and structural properties.
- Fundamental study on ionic migration of enhanced polysaccharides based solid biopolymer electrolytes via FTIR-TGA approach.
- Activated carbon from agriculture/seafood waste as a potential active material for supercapacitor electrode.

EXPERT LINKAGES

- URICH TECHNOLOGY, Sg. Petani, Kedah
- Ionic and Kinetic Materials Research (IKMaR) Laboratory, Faculty of Science and Technology, Universiti Sains Islam Malaysia
- Fakulti Sains dan Teknologi, Universiti Teknologi Malaysia
- Fakulti Biokejuruteraan dan Teknologi, Universiti Malaysia Kelantan

PROFFESIONAL MEMBERSHIP

- Malaysia Board of Technologists (MBOT) - Professional Technologist/Member
- International Association of Engineers (IAENG) - Member
- Institut Fizik Malaysia (IFM) - Member
- Persatuan Sains dan Teknologi Keadaan Pepejal Malaysia (MASS) - Member

GRANTS

- Project : Fundamental Correlation between Ionic Migration and Electrochemical performance of Supercapacitor based Solid Polymer Electrolyte
- Position : Project Leader
- Grant Name : Talent and Publication Enhancement Research Grant **(TAPE-RG)**
- Status : Active (1 Dec. 2020 – 28 Feb. 2023)
- Amount : RM20,000
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- Project : Investigation on the Role of Thiosemicarbazides and Their Complexes as Potential Dopant in Biopolymer Electrolytes
- Position : Co-Researcher
- Grant Name : Fundamental Research Grant Scheme **(FRGS 2020-1)**
- Status : Active (1 Nov. 2020 – 31 Oct. 2022)
- Amount : RM83,710
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- Project : Transport properties estimation and electrochemical studies on ion-conducting solid polymer electrolyte as potential solid state battery
- Position : Co-Researcher
- Grant Name : Fundamental Research Grant Scheme **(FRGS 2019-1)**
- Status : Active (1 Sept. 2019 – 31 August 2022)
- Amount : RM132,640

Project : Simple acts big impact
Position : Co-Researcher
Grant Name : Knowledge and Technology Assimilation Grant Schemes (**KTAG 2020**)
Status : Active (1 Mac 2020 – 30 April 2021)
Amount : RM5,000

Project : Ionic transport properties of plasticized carboxymethyl cellulose – ammonium chloride solid biopolymer electrolytes via computational analysis
Position : Co-Researcher
Grant Name : UTM Encouragement Research (**UTMER**) Grant
Status : Active (1 Oct. 2020 – 30 Sept. 2022)
Amount : RM56,000

Project : Transport properties estimation and electrochemical studies on ion-conducting solid polymer electrolyte as potential solid state battery
Position : Co-Researcher
Grant Name : Fundamental Research Grant Scheme (**FRGS 2019-1**)
Status : Active (1 Sept. 2019 – 31 August 2022)
Amount : RM132,640

Project : Fundamental study on alginate-based edible coating on osmotic transport mechanism, physic-chemical properties and cell structure of ginger
Position : Co-Researcher
Grant Name : Fundamental Research Grant Scheme (**FRGS-RACER 2019-1**)
Status : Active (1 Sept. 2019 – 31 August 2021)
Amount : RM60,000

Project : Evaluation of physico-chemical and mechanical properties of *Zingiber Officinale* using CMC as edible coating material
Position : Co-Researcher
Grant Name : Talent and Publication Enhancement-Research Grant (**TAPE-RG 2018**)
Status : Completed (1 April 2018 – 31 Mac 2020)
Amount : RM20,000

Project : Fundamental study on ionic transport of enhanced CMC solid biopolymer electrolytes via FTIR deconvolution approach
Position : Co-Researcher
Grant Name : Fundamental Research Grant Scheme (**FRGS 2016-1**)
Status : Completed (1 August 2016 – 30 July 2018)
Amount : RM87,100

AWARDS

- HyDo – Sustainable conductive bioplastic for future green energy storage, Virtual Materials Technology Challenges 4.0 2020 (v-MTC4.0), Universiti Putra Malaysia, Gold Medal.
- Alginate based-edible composite coating improves the mass transfer osmotic dehydration process on ginger slices, Virtual Materials Technology Challenges 4.0 2020 (v-MTC4.0), Universiti Putra Malaysia, Silver Medal.
- CoNa – Electrically conductive solid bio-polymer electrolytes from corn starch-NaSO₃ for sodium battery application, Virtual Materials Technology Challenges 4.0 2020 (v-MTC4.0), Universiti Putra Malaysia, Bronze Medal.
- Low-cost nanoparticles from wasted seashell for urea biosensor development, E-carnival Research and Innovation 2020 (e-CRI2020), Universiti Malaysia Kelantan, Bronze Medal.

PUBLICATIONS

Journal Article

1. Nur Izzati Zakaria, Rosmawani Mohammad, Sharina Abu Hanifah, Khadijah Hilmun Kamarudin, Azrilawani Ahmad. (2021). Low cost and eco-friendly nanoparticles from cockle shells as a potential matrix for the immobilisation of urease enzyme. *Journal of Chemistry*. 103056. <https://doi.org/10.1016/j.arabjc.2021.103056>. *In-Press*.
2. Vigneswari S, Chai JM, Kamarudin KH, Amirul A-AA, Focarete ML and Ramakrishna S. (2020). Elucidating the Surface Functionality of Biomimetic RGD Peptides Immobilized on Nano-P(3HB-co-4HB) for H9c2 Myoblast Cell Proliferation. *Frontiers in Bioengineering and Biotechnology*. 8:567693. doi: 10.3389/fbioe.2020.567693
3. Uwaisulqarni M. Osman, Sharmili Silvarajoo, Khadijah H. Kamarudin, Mohamed Ibrahim Mohamed Tahir, Huey Chong Kwong. (2021). Ni(II) complex containing a thiosemicarbazone ligand: Synthesis, spectroscopy, single-crystal X-ray crystallographic and conductivity studies. *Journal of Molecular Structure*. 1223:128994. doi.org/10.1016/j.molstruc.2020.128994.
4. Sharmili Silvarajoo, Uwaisulqarni M. Osman, Khadijah H. Kamarudin, Mohd Hasmizam Razali, Hanis Mohd Yusoff, Irshad Ul Haq Bhat, Mohd Zul Helmi Rozaini, Yusnita Juahir. (2020). Dataset of theoretical Molecular Electrostatic Potential (MEP), Highest Occupied

- Molecular Orbital-Lowest Unoccupied Molecular Orbital (HOMO-LUMO) band gap and experimental coe-coe plot of 4-(ortho-, meta- and para-fluorophenyl)thiosemicarbazide isomers. *Data in Brief*. 32:106299. doi.org/10.1016/j.dib.2020.106299.
5. Nur Hafiza Mr Muhamaruesa, Khadijah Hilmun Kamarudin, Mohd Ikmar Nizam Mohamad Isa, Nora Salina Md Salim. (2020). Effect of drying temperature on electrical impedance characteristic of ginger slices. *International Agrophysics*. 34(2): 281–287. doi.org/10.31545/intagr/120429.
 6. Nora Salina Md Salim, Khadijah Hilmun Kamarudin and Mohd Ikmar Nizam Mohamad Isa. (2020). Effects of process variables on mass transfer during osmotic dehydration of ginger slices using carboxymethyl cellulose as an edible coating material. *Journal of Sustainability Science and Management*. 15 (2):12-23.
 7. F. F. Awang, M. F. Hassan, C. K. Sheng, K. H. Kamarudin. (2020). Conductivity and transport properties of the solid polymer electrolyte system corn starch-NaHSO₃. *Technology Reports of Kansai University*. 62(2):159-8.
 8. Awang, F.F., Kamarudin, K.H., & Hassan, M.F. Conductivity and transport properties of the solid polymer electrolyte system corn starch-NaHSO₃. *Technology Reports of Kansai University*, 2020, 62(2), 159-168.
 9. Osman, Uwaisulqarni M., Silvarajoo, Sharmili, Kamarudin, Khadijah H., Tahir, Mohamed Ibrahim Mohamed, & Kwong, Huey Chong. Ni(II) complex containing a thiosemicarbazone ligand: Synthesis, spectroscopy, single-crystal X-ray crystallographic and conductivity studies. *Journal of Molecular Structure*, 2020, 1223, 128994.
 10. Sharmili Silvarajoo, Uwaisulqarni M. Osman, Khadijah Hilmun Kamarudin, Mohd Hasmizam Razali, Hanis Mohd Yusoff, Irshad UIHaqBhat, Mohd Zul Helmi Rozaini, Yusnita Juahir. Dataset of theoretical Molecular Electrostatic Potential (MEP), Highest Occupied Molecular Orbital- Lowest Unoccupied Molecular Orbital (HOMO-LUMO) band gap and experimental coe-coe plot of 4-(ortho-, meta- and para-fluorophenyl)thiosemicarbazide isomers. *Data in Brief*, 2020, 32, 106299.
 11. Hafiza, Mr Muhamaruesa Nur, Kamarudin, Khadijah Hilmun, Mohamad Isa, Mohd Ikmar Nizam, & Md Salim, Nora Salina. Effect of drying temperature on electrical impedance characteristic of ginger slices. *International Agrophysics*, 2020, 34(2), 281-287.
 12. Salim, Nora Salina Md, Kamarudin, Khadijah Hilmun, & Isa, Mohd Ikmar Nizam Mohamad. Effects of process variables on mass transfer during osmotic dehydration of ginger slices using carboxymethyl cellulose as an edible coating material. *Journal of Sustainability Science and Management*, 2020, 15(2), 12-23.
 13. Kamarudin, K.H., Hassan, M. and Isa, M.I.N. Lightweight and flexible solid-state EDLC based on optimized CMC-NH₄NO₃ solid bio-polymer electrolyte, *ASM Science Journal (Special Issue)*, 2018(1) AiMS2018, 29-36. (Scopus/Q4)
 14. Hassan, M.F., Azimi, N.S.N., Kamarudin, K.H. and Sheng, C.K. Solid polymer electrolytes based on starch-magnesium sulphate: study on morphology and electrical conductivity, *ASM Science Journal (Special Issue)*, 2018(1) AiMS2018, 17-28. (Scopus/Q4)
 15. F. Nurhaziqah K., Sheng, C.K., Amin, K.A.M., Isa, M.I.N., Hassan, M.F., Ali, E.A.G.E., Kamarudin, K.H. and Aarif, R. Effect of HNO₃ Concentration on Etch Rate and Structure of Si Wafer Etched in the Mixture of HF and HNO₃ Solutions, *ASM Science Journal (Special Issue)*, 2018(1) AiMS2018, 68-74. (Scopus/Q4)
 16. Hassan, M.F., Zainuddin, S.K., Kamarudin, K.H., Sheng, C.K., Abdullah, M.A.A. Ion-conducting polymer electrolyte films based on poly(sodium 4-styrenesulfonate) complexed with

- ammonium nitrate: Studies based on morphology, structural and electrical spectroscopy. Malaysian Journal of Analytical Sciences 2018,22 (2), 238 - 248.(Scopus/Q4)
17. Kamarudin, K.H. and Isa, M.I.N. Ionic conductivity via quantum mechanical tunneling in NH₄NO₃doped carboxymethyl cellulose solid biopolymer electrolytes. Advanced Materials Research, 2015, 1107,236-241.
 18. Kamarudin, K.H., Abdul Rani, M.S.A and Isa, M.I.N. Ionic conductivity and conduction mechanism of biodegradable dual polysaccharidesblend electrolytes. American-Eurasian Journal of Sustainable Agriculture, 2015, 9(2),8-14.
 19. Ramlli, M.A., Kamarudin, K.H. and Isa, M.I.N. Ionic conductivity and structural analysis of carboxymethyl cellulose doped with ammonium fluorideassolidbiopolymer electrolytes. American-Eurasian Journal of Sustainable Agriculture, 2015, 9(2),46-51.
 20. Kamarudin, K.H. and Isa, M.I.N. Structural and DC ionic conductivity studies of carboxymethylcellulosedopedwithammoniumnitrateassolidpolymerelectrolytes. International Journal of Physical Sciences, 2013, 8(31),1581-1587.
 21. Lim, T.H., Ingham, B., Kamarudin, K.H., Etchegoin, P.G. and Tilley, R.D. Solution synthesis of monodisperse indium nanoparticles and highly faceted indium polyhedra, Crystal Growth and Design, 2010, 10(9),3854-3858. (WoS/Q1)

Conference Publication

1. Kamarudin, K.H. and Isa, M.I.N. *Electrochemical performance of proton battery based cellulose solid polymer electrolytes*, Proceedings of National Workshop on Functional Materials, 2017, Centre for Ionics, University Malaya, Kuala Lumpur.
2. Kamarudin, K.H. and Isa, M.I.N. *Transport properties of biodegradable cellulose biopolymer electrolytes*, 2015. Proceeding of EasternCorridorRenewableEnergy.
3. Kamarudin, K.H. and Isa, M.I.N. *Investigation on conductivity and complexation of NH₄NO₃ based cellulose complexes*, 2013, 12thUMTInternational Annual Symposium UMTAS, 2013 Proceeding, p.867-873.

SUPERVISION

Doctor of Philosophy Degree

Thesis Title : The optimization of natural binder in zinc anode for solid proton battery application

Student Name : Muhamad Amirullah Ramlli (GSK2669)

Role : Main supervisor

Status : On-Going

Thesis Title : Ionic conductivity, structural and ion transport properties of enhanced 2-hydroxyethyl cellulose/ ammonium nitrate solid biopolymer electrolyte for rechargeable proton battery application
Student Name : Nur Hafiza Mr Muhamaruesa (GSK1939)
Role : Co-supervisor
Status : Graduated - 2019

Thesis Title : Preparation and characterization of solid biopolymer electrolytes based on carboxymethyl cellulose doped ammonium thiocyanate with ethylene carbonate plasticizer and its application
In solid state proton battery
Student Name : Noor Azniza binti Mohd Noor (GSK1611)
Role : Co-supervisor
Status : Graduated - 2019

Master Degree

Thesis Title : Electrical, structural & ionic transport properties of 2-hydroxyethyl cellulose doped with dodecyltrimethyl ammonium bromide solid biopolymer electrolytes
Student Name : Nur Yasmin Abu Bakar (GSK1943)
Role : Main Supervisor
Status : Graduated - 2020

Thesis Title : Synthesis, DFT studies and conductivity properties of thin film containing thiosemicarbazide derivatives and their transition metal complexes
Student Name : Sharmili Silvarajoo (P3583)
Role : Co-Supervisor
Status : On-Going

Thesis Title : Electrochemical characterization of zinc/carbon battery based solid polymer electrolytes
Student Name : Muhammad Naquiddin Syahmie Anuar (P4385)
Role : Main Supervisor
Status : On-Going

Thesis Title : Structural, morphology and electrical effects of biodegradable solid polymer electrolytes as super-conductive electrolytes in solid-state battery

Student Name : Fatin Farhana Awang (P4358)

Role : Co-Supervisor

Status : On-Going

Thesis Title : Structural, transport and electrical studies of 2-HEC-NH₄Cl solid bio-polymer electrolytes for proton battery

Student Name : Amzar Arif Mejenom (3191021)

Role : Co-Supervisor

Status : On-Going

COURSE TAUGHT

- Materials Science (FIZ3401), Undergraduate, Sem II, Session 2020/2021, Faculty of Ocean Engineering, Technology and Informatics, Universiti Malaysia Terengganu.
- Atomic Physics (FIZ4107), Undergraduate, Sem I, Session 2020/2021, Faculty of Ocean Engineering, Technology and Informatics, Universiti Malaysia Terengganu.
- Solid State Physics (FIZ4401), Undergraduate, Sem II, Session 2019/2020, Faculty of Ocean Engineering, Technology and Informatics, Universiti Malaysia Terengganu.
- Fundamental Physics (FIZ3000), Undergraduate, Sem I, Session 2019/2020, Faculty of Ocean Engineering, Technology and Informatics, Universiti Malaysia Terengganu.
- Physics I (FZK1801), STEM Foundation, Sem I, Session 2019/2020, STEM Foundation Centre, Universiti Malaysia Terengganu.
- Solid State Physics (FIZ4401), Undergraduate, Sem II, Session 2018/2019, School of Ocean Engineering, Universiti Malaysia Terengganu.
- Solid State Physics (FIZ4401), Undergraduate, Sem I, Session 2018/2019, School of Ocean Engineering, Universiti Malaysia Terengganu.
- Solid State Physics (FIZ4401), Undergraduate, Sem II, Session 2017/2018, School of Ocean Engineering, Universiti Malaysia Terengganu.
- Materials Science (FIZ3401), Undergraduate, Sem I, Session 2017/2018, School of Ocean Engineering, Universiti Malaysia Terengganu.
- Solid State Physics (FIZ4401), Undergraduate, Sem II, Session 2016/2017, School of Ocean Engineering, Universiti Malaysia Terengganu.
- Atomic Physics (FIZ4107), Undergraduate, Sem II, Session 2016/2017, School of Ocean Engineering, Universiti Malaysia Terengganu.
- Materials Science (FIZ3401), Undergraduate, Sem I, Session 2016/2017, School of Ocean Engineering, Universiti Malaysia Terengganu.
- Fundamental Physics (FIZ3000), Undergraduate, Sem I, Session 2016/2017, School of Ocean Engineering, Universiti Malaysia Terengganu.

LINKS

- SCOPUS ID: [57202012342](https://scopus.com/authorid/57202012342)
- Researcher ID : [O-8923-2016](https://orcid.org/0000-0002-7374-3134)
- Researchgate : https://www.researchgate.net/profile/K_Kamarudin2
- Publons : <https://publons.com/researcher/2204830/khadijah-hilmun-kh-kamarudin/>
- ORCID : <https://orcid.org/0000-0002-7374-3134>

JOURNAL REVIEWER

- iCITES2020
- Journal of Science and Technology
- Materials Science and Engineering
- International Journal of Materials Science and Applications